northern parts of the west coast. Mr. Kemp found both on the coast of Portuguese India.

NOTES ON ECHIUROIDS FROM CHANDIPORE, ORISSA.

By B. PRASHAD, *D.Sc.*

In May 1919, Dr. F. H. Gravely obtained two specimens of Echiuroids from the mud-flats at Chandipore on the coast of the Bay of Bengal. The two specimens belong to the genus *Thalassema*, Gaertner, and are referable to two distinct species. One of the specimens is without the proboscis and so it is impossible to assign it to its species with any great certainty, but it bears in general shape and anatomy a very close resemblance to *T. branchiorhynchus*, Annandale and Kemp,[1] which was collected previously by Dr. Gravely at the same locality in fairly large numbers. The other specimen cannot be assigned to any previously known species and is described as a new one. This species is very important from a biological point of view, and affords an interesting example of the occurrence under essentially similar biological conditions of animals with exactly opposite types of apparently adaptive characters.

Thalassema branchiorhynchus, Annandale and Kemp.

1915. *Thalassema branchiorhynchus*, Annandale and Kemp, *Mem. Ind. Mus.*, V, p. 61, figs, 2, 3.
1919. *Thalassema branchiorhynchus*, Prashad, *Mem. As. Soc. Bengal*, VI, p. 324.

I assign the specimen without the proboscis to this species with some hesitation, because the most characteristic feature of the species—the proboscis—is absent. In the position of the proboscis a semicircular scar is to be seen, and from this it appears that the proboscis must have been cast off long ago, for the scar is quite healed up, and there is no trace of the openings of the vascular sinuses.

The specimen is preserved in an expanded condition, and is an elongated sickle-shaped organism much more pointed at the posterior than at the anterior end. The length is 31 mm. and the maximum breadth only 5 mm. The arrangement of the integumentary papillae is very similar to that described for the type-specimen. The general anatomy also is identical.

Thalassema microrhynchus, sp. nov.

There is a single specimen of this species from the same locality as the preceding one. Preserved in an expanded condition,

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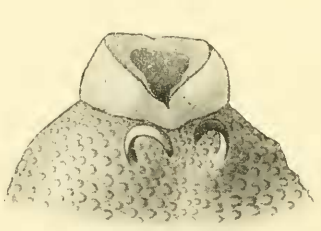
[1] *Mem. Ind. Mus.*, V, p. 61 (1915).

it measures 26·5 mm. in total length, of which 1·4 mm. is formed by the proboscis. The greatest breadth at a point just behind the middle is 7 mm., but this measurement is very unreliable as it varies greatly with the state of expansion or otherwise at the time of preservation. In general shape the animal is elongate, slightly curved near the middle and pointed at both ends.

The proboscis, the length of which is only one nineteenth of the entire length of the body, is a rudimentary structure. Its cross section a little behind the tip would be more or less of a semi-circle, while near the base where the two margins are united the structure becomes quite tubular. In appearance it resembles the proboscis of *T. sabinum* described by me in another paper,[1] except that the structure is at a much lower grade of development. The two species agree in the lateral margins of the proboscis being united ventrally at the base, but in other respects such as the absence of finger-shaped outgrowths in the Indian form they are



Thalassema microrhynchus, sp. nov.
Ventral view of the proboscis and setal region, × 8.

quite different from one another. The distal free end of the proboscis is truncated. No ciliated groove is to be made out on the ventral surface but the inner surface anteriorly shows longitudinal furrows. The dorsal surface is practically smooth.

The body wall is covered with papillae, which near the two ends of the body are arranged in definite rings; between the rings of large papillae rows of much smaller ones are also visible. On the ventral surface of the body about the middle there is a crescentic area on which the adjacent papillae are united together to form small elongated ridges, but the individuality of the papillae can still be distinguished. The circum-anal region also shows distinct papillae covering it.

The ventral hooks are situated very near the anterior end; they are, as shown in the figure, very well developed and have the free projecting portion of the hooks very broad and curved.

[1] *Mem. As. Soc. Bengal*, VI, p. 325 (1919).

The longitudinal muscles form a continuous sheath and are not divided into bundles.

There are two pairs of segmental organs with their external openings behind the level of the ventral hooks. The vesicle is an elongated bag-like structure with the free closed end pointing backwards, and has the mouth of the internal funnel drawn out into very long spiral lobes.

The anal vesicles are of a simple type, about half the length of the body, and each provided with two rows of ciliated funnels on their anterior half. There is nothing special to note with regard to the rest of the anatomy.

The animal preserved in spirit after fixation in formalin is of a pale yellow colour; the proboscis, however, is very much lighter in tint, being creamy white.

Type specimen:—W $\frac{210}{1}$ in the collection of the Zoological Survey of India (Indian Museum).

The species under consideration belongs to the group of *Thalassema* treated of in my paper referred to above. The general anatomy and form are very similar; the most important feature, however, in which it differs from the forms discussed in that paper is the low grade of development of the proboscis. In discussing the different grades of development of this structure in the various species I stated, that in *T. sabinum* we have a form which shows the origin of small processes from the ventral margins of the proboscis, that in the second species *T. dendrorhynchus* the processes are much better developed even becoming dendritic by division, while in *T. branchiorhynchus* the processes are still better developed forming regular gills. The condition in the present form is even more primitive than in *T. sabinum*, for there is only a proboscis of a rudimentary type without any processes. *T. microrhynchus* in this respect represents probably the most primitive member of this group of the genus *Thalassema*.

A point of great biological interest arises from the occurrence under similar conditions of two such diverse forms as *T. branchiorhynchus* and *T. microrhynchus*, which stand at two extremes as to the development of the proboscis and the branchial processes. Specimens of the two species have been collected from the same locality, living under apparently similar biological conditions. The lines of evolution of respiratory structures in the two forms, however, are as divergent as possible. Whereas in *T. branchiorhynchus* the respiratory surface has been very greatly increased by the development of a large proboscis and very long, branched branchial processes, in the other (*T. microrhynchus*) the proboscis is quite rudimentary. Similar cases of adaptive characters of exactly opposite type developed by two species living in similar biological surroundings are not unknown elsewhere, and reference may be made to the various examples amongst sponges cited by Annandale.[1] In all these cases the two species have developed or at

[1] *Journ. As. Soc. Bengal* (n. s.), IX, p. 75 (1913), *Mem. Ind. Mus.*, V, p. 54 (1915) and *Mem. As. Soc. Bengal*, VI, pp. 196-197 (1918).

any rate possess special characters adapting them to a peculiar habitat, but the structural peculiarities are of an exactly opposite nature. In the present case it is impossible to say whether the special structures have a particular physiological function, or whether they are merely highly developed in the one case and rudimentary in the other. We do not know what are the effects of this type of diverse evolution on the two species.